

## *Hadwenius pontoporiae* sp. n. (Digenea: Campulidae) from the Intestine of Franciscana (Cetacea: Pontoporiidae) in Argentinian Waters.

J. A. RAGA,<sup>1</sup> J. AZNAR,<sup>1</sup> J. A. BALBUENA,<sup>1</sup> AND M. D. DAILEY<sup>2</sup>

<sup>1</sup> Departamento de Biología Animal (Zoología), Universidad de Valencia, Dr. Moliner 50, 46100 Burjassot, Valencia, Spain and

<sup>2</sup> Ocean Studies Institute, California State University, 1250 Bellflower Boulevard, Long Beach, California 90840

**ABSTRACT:** *Hadwenius pontoporiae* sp. n. from the intestine of franciscana (*Pontoporia blainvillei*) in Argentinian waters is described. This new species differs from the other *Hadwenius* species in body and cirrus pouch dimensions, shape, and disposition of the gonads and distribution of vitellaria. This is the first record of a campulid in the franciscana, and the genus *Hadwenius* is reported for the first time in the South Atlantic Ocean.

**KEY WORDS:** *Hadwenius pontoporiae* sp. n., Digenea, *Pontoporia blainvillei*, Cetacea, South Atlantic Ocean.

*Pontoporia blainvillei* (Gervais and d'Orbigny, 1844), known as franciscana, or La Plata dolphin, has a limited distribution along the Atlantic coast of South America (Brownell, 1989). The parasite fauna of this species is insufficiently known, although some previous surveys were carried out in Uruguayan waters (Schmidt and Dailey, 1971; Kagei et al., 1976; Brownell, 1981, 1989).

In cooperation with a research project concerning the biology and factors limiting the population of *P. blainvillei* in Argentinian waters, a parasitological survey was carried out. So far, no digeneans have been reported in this host, but in our study 2 species were found, one in the submucosa of the main stomach, *Pholeter gastrophilus* (Kossack, 1910), and another in the intestine. The latter was identified as an undescribed species of the family Campulidae and is the subject of this article.

### Materials and Methods

This study was based on 23 franciscanas incidentally caught in shark fishery nets in Necochea and Clamonte (Buenos Aires Province, Argentina) between 1988 and 1990. The examination of 16 fresh and 7 frozen intestines revealed the presence of digenetic trematodes.

The helminths were washed in saline solution, fixed, and preserved in 70% ethanol. Twenty specimens from 3 fresh intestines were selected for study. They were stained in Semichon's acetocarmine and celestine blue B, dehydrated in a graded ethanol series, cleared in xylene, and mounted in Canada balsam. Serial sections of additional specimens were cut at 10–15  $\mu$ m and stained in Ehrlich's acid hematoxylin and eosin.

All measurements are in micrometers unless otherwise indicated. Ranges are given with means in paren-

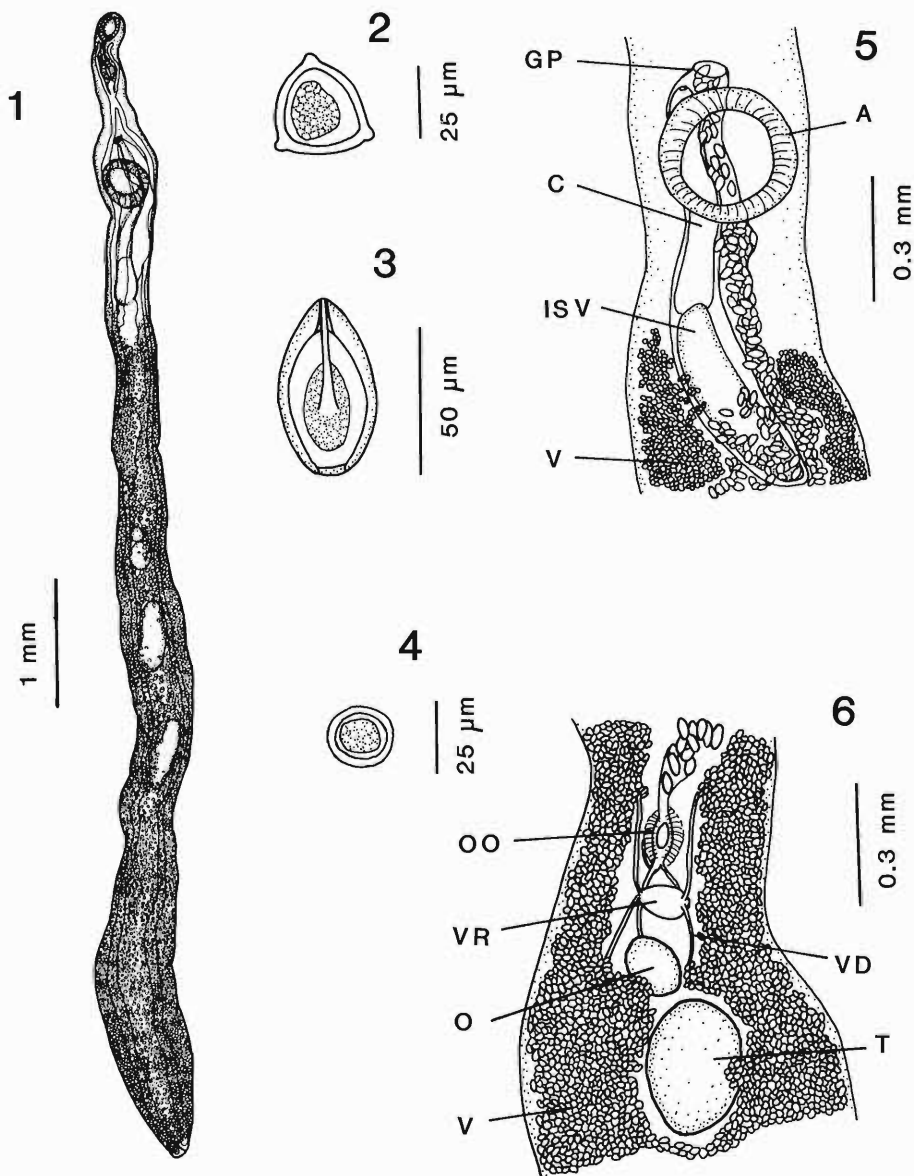
theses. Illustrations were made with the aid of a drawing tube.

### Results

#### *Hadwenius pontoporiae* sp. n. (Figs. 1–6)

**DESCRIPTION** (based on 20 specimens): With characters of the genus. Body elongate, slender, dorsoventrally flattened, 3.37–9.77 mm (6.11 mm) long, maximum width behind posterior testis 341–813 (605). Tegument spinose, spines more concentrated on anterior midbody, length of spines 11–18 (14). Oral sucker subterminal, 125–198 (160) long by 116–166 (147) wide. Acetabulum larger than oral sucker, in first quarter of body, 246–349 (297) long by 258–369 (316) wide. Distance between suckers 629–1,903 (1,021). Prepharynx, 24–317 (130) long. Pharynx pyriform, 143–227 (184) long by 88–123 (100) wide. Esophagus extremely variable in length, usually short. Intestine H-shaped, ceca terminating blindly near posterior margin of body. Anterior intestinal branches extending up to posterior margin of oral sucker. Excretory vesicle tubular, pore terminal. Ceca and anterior intestinal branches without inner or outer lateral diverticula.

Testes elongate, oval in shape, entire, tandem; situated in third quarter of body. Anterior testis 193–513 (322) long by 115–205 (164) wide. Posterior testis 205–431 (320) long by 147–267 (214) wide. Intertesticular distance 90–472 (291). Posterior testis at 1.09–3.06 mm (1.99 mm) from caudal extremity of body. Cirrus pouch 0.68–1.15 mm (0.91 mm) long, extends posteriad well



Figures 1-6. *Hadwenius pontoporiae* sp. n. 1. Whole mount. 2. Egg, cross-section at abopercular pole. 3. Egg, lateral view. 4. Egg, cross-section at opercular pole. 5. Acetabular region. 6. Proximal female genitalia. Abbreviations: A = acetabulum, C = cirrus, GP = genital pore, ISV = internal seminal vesicle, O = ovary, OO = ootype, T = testis, V = vitellarium, VD = vitelline duct, VR = vitelline reservoir.

beyond acetabulum, contains coiled seminal vesicle located at its proximal extremity. Cirrus armed. Cirrus pouch opening into medial genital pore immediately anterior to margin of acetabulum. Genital pore at 0.56-2.00 mm (1.05 mm) from anterior margin of body.

Ovary oval or subglobular, pretesticular,

slightly dextral to midline, 100-256 (177) long by 65-178 (119) wide, situated at 8-170 (124) from anterior testis and 0.80-2.09 mm (1.2 mm) from acetabulum. Ootype and Mehlis' gland situated anterior to ovary. Laurer's canal present. Seminal receptacle absent. Vitelline reservoir conspicuous, ovoid, between ootype and ovary,

sometimes ventral to ovary, 53–170 (102) long by 32–90 (71) wide. Vitellaria arranged in acinous bunches, profuse, commencing at seminal vesicle extending to posterior extremity. Uterus coiled in preovarian intercecal field, widening into unarmed metraterm before opening into genital pore. Eggs oval, truncate at the opercular pole, triangular in cross-section at abopercular pole, circular in cross-section at opercular pole, 54–59 (56,  $n = 40$ ) long by 32–37 (34,  $n = 40$ ) wide.

**DEFINITIVE HOST:** *Pontoporia blainvillei* (Gervais and d'Orbigny, 1844), franciscana, or La Plata dolphin.

**SITE:** Small intestine.

**TYPE LOCALITY:** Necochea (38°37'S, 58°50'W) (Buenos Aires Province), Argentina, South Atlantic Ocean.

**PREVALENCE:** 100%.

**INTENSITY OF INFECTION:** 8–1,023 specimens ( $\bar{x} = 255$ ). No apparent pathological effects were observed.

**SPECIMENS DEPOSITED:** Holotype USNM Helm. Coll. No. 82915 and paratypes USNM Helm. Coll. No. 82916; other paratypes British Museum (Natural History) Reg. No. 1993.5.17.1–2 and Department of Animal Biology, University of Valencia, Coll. Nos. PB.N88.1–21, PB.N89.1–16, and PB.N90.1–11.

**ETYMOLOGY:** The specific name *pontoporiae* is derived from the generic name of the host, emphasizing that this is the first occurrence of a member of the genus *Hadwenius* in a host of the family Pontoporiidae.

### Discussion

There are currently 36 species recognized in the family Campulidae Odhner, 1926. All parasitize aquatic mammals, mainly marine and freshwater cetaceans, but also pinnipeds and the sea otter (*Enhydra lutris*). Campulids are found in all oceans of the world.

The taxonomy of this family is confusing and in need of review. Yamaguti (1971) considered 6 subfamilies: Campulinae Stunkard and Alvey, 1930, Hunterotrematinae Yamaguti, 1971, Lecithodesminae Yamaguti, 1958, Odhneriellinae Yamaguti, 1958, Orthosplanchninae Yamaguti, 1958, and Synthesiinae Yamaguti, 1958. However, Adams and Rausch (1989) synonymized Odhneriellinae with Orthosplanchninae, and Skrjabin (1976) indicated that, due to the presence of anterior intestinal branches, *Synthesium*

*tursionis* (Marchi, 1873), the only member of the subfamily Synthesiinae, should be transferred to the Orthosplanchninae. Thus, pending further studies, this leaves 4 subfamilies: Campulinae, Lecithodesminae, Hunterotrematinae, and Orthosplanchninae.

The specimens studied exhibit an elongate body, the intestine shows no lateral diverticula, and the acetabulum is situated in the anterior third of the body, which are all characters of the Orthosplanchninae (Yamaguti, 1971; Adams and Rausch, 1989). According to the most recent taxonomic criteria (Adams and Rausch, 1989), this subfamily is composed of 3 genera: *Orthosplanchnus* Odhner, 1905, *Oschmarinella* Skrjabin, 1947, and *Hadwenius* Price, 1932. The present specimens should be included in the latter because they show a high length/width ratio of the body; possess a long, clavate cirrus lined with spines; possess an unarmed metraterm; and vitellaria do not extend to the acetabular level.

Adams and Rausch (1989) considered 5 species within the genus *Hadwenius*: *H. seymouri* Price, 1932, *H. nipponicus* Yamaguti, 1951, *H. mironovi* (Krotov and Delyamure, 1952), *H. elongatus* (Ozaki, 1935), and *H. subtilis* (Skrjabin, 1959), but the authors recognize 1 additional species, *H. delamurei* (Raga and Balbuena, 1988) (see Balbuena, 1991).

Four Orthosplanchninae species have an uncertain generic allocation: *Orthosplanchnus sudarikovi* Treshchev, 1966, *Odhneriella* (*Campula*) *gondo* (Yamaguti, 1942), *Leucasiella arctica* Delyamure and Kleinenberg, 1958, and *Synthesium tursionis* (see Skrjabin, 1976; Adams and Rausch, 1989). However, until further evidence is available, these species should be regarded as incertae sedis and will not be considered in the present discussion.

*Hadwenius seymouri* differs from the new species in body and egg size, situation of oral sucker and gonads, and extension of vitellaria (Price, 1932), whereas *H. elongatus* differs in body size and morphology of the testes (Ozaki, 1935) (Table 1). *Hadwenius nipponicus* shows larger body and eggs than *H. pontoporiae* and vitellaria commencing at testicular level (Yamaguti, 1951) (Table 1). *Hadwenius mironovi* can be distinguished from *H. pontoporiae* by the disposition of the gonads and vitellaria and having the cirrus pouch shorter and the eggs larger (Delyamure, 1964) (Table 1). *Hadwenius subtilis* shows a much larger body and the oral sucker is terminal (Balbuena

Table 1. Differential characters of *Hadwenius* species.\*

	<i>H. seymouri</i>	<i>H. elongatus</i>	<i>H. niponicus</i>	<i>H. mironovi</i>	<i>H. subtilis</i>	<i>H. delamurei</i>	<i>H. pontoporiæ</i> n. sp.
Body length	27-60	13-18	17.5-22	8.90-12.89	14.03-38.34 (33.35)	9.7-16.8 (12.1)	3.37-9.37 (6.11)
Maximum width	1.5-2	1-2.1	0.95-1.25	0.72-1.25	1.23-1.95 (1.52)	0.59-0.79 (0.67)	0.34-0.81 (0.60)
Oral sucker position	Terminal	Subterminal	Subterminal	Terminal	Terminal	Subterminal	Subterminal
Cirrus pouch length	1.8	0.9-1.5	1.55-2	—	2.4-6.1 (4.4)	2.0-3.4 (2.5)	0.6-1.1 (0.9)
Testis shape	Entire	Lobed	Entire	Entire	Entire	Entire	Entire
Gonads position	Anterior 1/3	Medial 1/3	Medial 1/3	Anterior 1/3	Medial 1/3	Posterior 1/3	Medial 1/3
Anterior extent of vitellaria	Anterior testis	Seminal vesicle	Anterior testis	Anterior testis	Seminal vesicle	Seminal vesicle	Seminal vesicle
Egg size (µm)	97 × 52	49-55 × 25-31	80-90 × 45-50	72-90 × 33-37	75-98 × 44-55 (89 × 49)	57-72 × 32-50 (67 × 40)	54-59 × 33-37 (56 × 34)
Host†	DI	NP	Pd, Pp	DI	Oo, DI, Gm	Gm	Pb
Geographical distribution	Alaska	Japan	Japan, U.S.A. (Pacific Coast)	North Pacific	North Pacific, White Sea, North Atlantic	Mediterranean, North Atlantic	South Atlantic
References	Price, 1932	Ozaki, 1935	Yamaguti, 1951; Ching and Robinson, 1959	Delvanyure, 1964	Balbuena et al., 1989	Raga and Balbuena, 1988; Balbuena, 1991	Present study

\* Measurements in millimeters unless stated otherwise, followed by the mean in parentheses.  
 † DI = *Delphinapterus leucas*, Gm = *Globicephala melas*, NP = *Neophocena phocaenoides*, Oo = *Orcinus orca*, Pb = *Pontoporia blainvillei*, Pd = *Phocaenoides dalli*, Pp = *Phococena phococera*.

et al., 1989) (Table 1). The specimens studied closely resemble *H. delamurei* in body and egg size, position of the oral sucker, shape of testes, and distribution of vitellaria. However, they clearly differ in the position of the gonads and length of the cirrus pouch (Table 1). They also exhibit a different egg shape. The eggs are circular in cross-section at the opercular pole in *H. pontoporiae* sp. n. (Fig. 4), whereas they are triangular in *H. delamurei* (Raga and Balbuena, 1988; Balbuena, 1991).

This is the first report of a campulid trematode parasitizing franciscanas, and a species of *Hadwenius* is reported for the first time in the South Atlantic Ocean and Southern Hemisphere. Given the high prevalence and mean intensity of *H. pontoporiae* sp. n. observed in this study, the absence of this species in previous reports from Uruguayan waters (situated about 500 km from the study area) is surprising.

#### Acknowledgments

The fieldwork was done in the Estación Hidrobiológica de Puerto Quequén (Necochea). We wish to thank Mr. J. Corcuera and Ms. F. Monzón (Consejo Nacional de Investigaciones Científicas y Técnicas and Museo Argentino de Ciencias Naturales) for their hospitality and valuable assistance while sampling in the field. Two anonymous reviewers provided very helpful, detailed critical comments. Funds were provided by the General Directorate of Scientific and Technological Research (DGICYT) of the Spanish Government (project No. PB87-146-C2-2). This article was completed during a visit by one of the authors (J.A.R.) to the California State University at Long Beach, made possible by a grant from the DGICYT.

#### Literature Cited

- Adams, A. M., and R. L. Rausch. 1989. A revision of the genus *Orthosplanchnus* Odhner, 1905 with consideration of the genera *Odhneriella* Skrjabin, 1915 and *Hadwenius* Price, 1932 (Digenea: Campulidae). *Canadian Journal of Zoology* 67:1268–1278.
- Balbuena, J. A. 1991. Estudio taxonómico y ecológico de la parasitofauna del calderon común, *Globicephala melas* (Traill, 1809) en las aguas de Europa. Doctoral Thesis, University of Valencia. 305 pp.
- , J. A. Raga, and E. Abril. 1989. Redescription of *Odhneriella subtila* (Skrjabin, 1959) (Digenea: Campulidae) from the intestine of *Globicephala melaena* (Traill, 1809) (Cetacea: Delphinidae) off the Faroe Islands (North-East Atlantic). *Systematic Parasitology* 14:31–36.
- Brownell, R. L., Jr. 1981. Biology of the Franciscana dolphins (*Pontoporia blainvillei*) in Uruguayan waters. *National Geographic Society Research Reports* 13:129–140.
- . 1989. Franciscana *Pontoporia blainvillei* (Gervais and d'Orbigny, 1844). Pages 45–67 in S. H. Ridgway and Sir R. Harrison, eds. *Handbook of Marine Mammals*. Vol. 4. Academic Press, London.
- Ching, H. L., and E. S. Robinson. 1959. Two campulid trematodes from a new host: the harbor porpoise. *Journal of Parasitology* 45:81.
- Delyamure, S. L. 1964. Enemies and parasites. Pages 292–312 in S. E. Kleinenberg, A. V. Yablokov, B. M. Bel'kovich, and M. N. Tarasevich, eds. *Beluga (Delphinapterus leucas) Investigations of the Species*. Akademiya Nauk S.S.S.R., Moscow. (In Russian: Translated by Israel Program for Scientific Translation, Jerusalem, 1969.)
- Kagei, N., T. Tobayama, and Y. Nagasaki. 1976. On the helminth of franciscana, *Pontoporia blainvillei*. *Scientific Reports of the Whales Research Institute* 28:161–166.
- Ozaki, Y. 1935. Trematode parasites of Indian porpoise *Neophocaena phocaenoides* Gray. *Journal of Science of the Hiroshima University, Serie B, Division 1* 3:115–138.
- Price, E. W. 1932. The trematode parasites of marine mammals. *Proceedings of the United States National Museum* 81:1–67.
- Raga, J. A., and J. A. Balbuena. 1988. *Leucasiella delamurei* sp. n. (Trematoda: Campulidae), a parasite of *Globicephala melaena* (Traill, 1809) (Cetacea: Delphinidae) in the western Mediterranean Sea. *Helminthologia* 25:95–102.
- Schmidt, G. D., and M. D. Dailey. 1971. Zoogeography and the generic status of *Polymorphus* (*Polymorphus*) *cetaceum* (Johston and Best, 1942) comb. n. (Acantocephala). *Proceedings of the Helminthological Society of Washington* 38:137.
- Skrjabin, A. S. 1976. Remarks on the systematics of Campulidae and Nasitremitidae (abstract). Pages 56–58 in A. V. Gaevskaya, ed. *Summaries of Reports of the Second All-Union Symposium on Parasites and Diseases of Marine Animals*. AtlantNIRO Kaliningrad, U.S.S.R. (In Russian.)
- Yamaguti, S. 1951. Studies on the helminth fauna of Japan. Part 45. Trematodes of marine mammals. *Arbeiten aus der Medizinischen Fakultät Okayama* 7:283–294.
- . 1971. Synopsis of Digenetic Trematodes of Vertebrates. Vols. I and II. Keigaku Publishing Co., Tokyo. 1,074 pp.